WHAT IS CLAIMED IS:

1. A semiconductor epitaxial structure including a first semiconductor epitaxial layer and a second semiconductor epitaxial layer, wherein:

the first semiconductor epitaxial layer has a narrower energy band gap than the second semiconductor epitaxial layer; and

the first semiconductor epitaxial layer includes a first semiconductor epitaxial sublayer of a first conductive type, a second semiconductor epitaxial sublayer of a second conductive type, and a pn junction interface between the first semiconductor epitaxial sublayer and the second semiconductor epitaxial sublayer.

2. The semiconductor epitaxial structure of claim 1, wherein:

the second semiconductor epitaxial layer is of the first conductive type; and

the first semiconductor epitaxial sublayer has an interface with the second semiconductor epitaxial layer.

3. The semiconductor epitaxial structure of claim 1, further comprising a third semiconductor epitaxial layer, the third semiconductor epitaxial layer having a wider energy band gap than the first semiconductor epitaxial layer, the first semiconductor epitaxial layer being sandwiched between the second and third semiconductor epitaxial layers.

4. The semiconductor epitaxial structure of claim 3, wherein:

the second semiconductor epitaxial layer is of the first conductive type;

the third semiconductor epitaxial layer is of the

second conductive type;

the first semiconductor epitaxial sublayer has an interface with the second semiconductor epitaxial layer; and

the second semiconductor epitaxial sublayer has an interface with the third semiconductor epitaxial layer.

5. The semiconductor epitaxial structure of claim 1, wherein the first and second semiconductor epitaxial sublayers are doped with respective impurities, the impurities being introduced when the first and second semiconductor epitaxial layers are formed by epitaxial growth.

6. A semiconductor structure including the semiconductor epitaxial structure of claim 1, further comprising:

a substrate; and

a sacrificial layer disposed between the substrate and said semiconductor epitaxial structure, enabling the semiconductor epitaxial structure to be separated from the substrate by lift-off.

7. A semiconductor light-emitting device including the semiconductor epitaxial structure of claim 1 as a light-emitting area, further comprising an electrode for supplying current to said semiconductor epitaxial structure, thereby causing the current to flow across the junction interface in the first semiconductor epitaxial layer of the semiconductor epitaxial structure.

8. A semiconductor light-emitting device comprising the semiconductor epitaxial structure of claim 1 as a light-emitting area, further comprising a first substrate, wherein the semiconductor epitaxial structure is formed on a second substrate having a sacrificial layer, the semiconductor

epitaxial structure being separated from the second substrate by lift-off and attached to the first substrate, the first substrate and the second substrate being made of different materials.

9. A semiconductor light-emitting device comprising:

a first substrate; and

an array of semiconductor epitaxial structures disposed on the first substrate, each semiconductor epitaxial structure including a first semiconductor epitaxial layer and a second semiconductor epitaxial layer, the first semiconductor epitaxial layer having a narrower energy band gap than the second semiconductor epitaxial layer, the first semiconductor epitaxial layer including a first semiconductor epitaxial sublayer of a first conductive type, a second semiconductor epitaxial sublayer of a second conductive type, and a pn junction interface between the first semiconductor epitaxial sublayer and the second semiconductor epitaxial sublayer;

light being emitted from the first semiconductor epitaxial layers in the semiconductor epitaxial structures.

10. The semiconductor light-emitting device of claim 9, wherein in each said semiconductor epitaxial structure:

the second semiconductor epitaxial layer is of the first conductive type; and

the first semiconductor epitaxial sublayer has an interface with the second semiconductor epitaxial layer.

11. The semiconductor light-emitting device of claim 9, wherein each said semiconductor epitaxial structure further comprises a third semiconductor epitaxial layer having a wider energy band gap than the first semiconductor epitaxial layer, the first semiconductor epitaxial layer being

sandwiched between the second and third semiconductor epitaxial layers.

12. The semiconductor light-emitting device of claim 11, wherein in each said semiconductor epitaxial structure:

the second semiconductor epitaxial layer is of the first conductive type;

the third semiconductor epitaxial layer is of the second conductive type;

the first semiconductor epitaxial sublayer has an interface with the second semiconductor epitaxial layer; and

the second semiconductor epitaxial sublayer has an interface with the third semiconductor epitaxial layer.

13. The semiconductor light-emitting device of claim 9, wherein the first and second semiconductor epitaxial sublayers are doped with respective impurities introduced when said first and second semiconductor epitaxial sublayers are formed by epitaxial growth.

14. The semiconductor light-emitting device of claim 9, wherein said semiconductor epitaxial structures are formed on a second substrate having a sacrificial layer, the semiconductor epitaxial structures being separated from the second substrate by lift-off and attached to the first substrate, the first substrate and the second substrate being made of different materials.

15. The semiconductor light-emitting device of claim 9, wherein the array of semiconductor epitaxial structures is substantially linear.